

user manual



DUDEK
paragliders

TABLE OF CONTENTS

Page

1. Introduction.....	3
2. The wing.....	4
2.1 Design	
2.2 Construction	
3. Flight operation.....	9
3.1 Steering lines and speed system adjustment	
3.2 Free flying	
3.2.1 Take-off	
3.2.2 Flight	
3.2.3 Landing	
3.2.4 Winching	
3.3 Powered flight	
3.3.1 Take-off	
3.3.2 Level flight	
3.3.3 Landing	
3.3.4 Golden rules	
3.4 Quick descent methods	
3.4.1 Big ears	
3.4.2 Spiral dive	
3.4.3 B-stall	
3.5 Acro Flying	
3.5.1 Wing over	
3.6 Extreme manoeuvres	
3.6.1 One sided collapse	
3.6.2 Frontal collapse	
3.6.3 Parachute stall	
3.6.4 Line over and cravatte	
3.6.5 Emergency steering	
4. Canopy care.....	26
4.1 Storage	
4.2 Cleaning	
4.3 Repair	
4.4 Deterioration - a few tips	
5. Technical data.....	28
6. Warranty, AeroCasco.....	29
7. What have you bought.....	31
8. Rigging tables.....	32
9. Risers.....	35

NOTE!

Please read this manual before your first flight

1. INTRODUCTION

CONGRATULATIONS!

We are pleased to welcome you among the growing number of Dudek Paragliders pilots. You've become a proud owner of state-of-the-art Nucleon Cabrio Paraglider, yet another trend-setter in powered paragliding world.

Extensive development, application of the most modern methods and thorough testing make the Nucleon Cabrio a user-friendly paraglider, offering the pilot a lot of fun combined with great performance.

We wish you many enjoyable and safe flying hours.

DISCLAIMER

Please read this Manual carefully and note following details:

- The purpose of this Manual is to offer guidelines to the pilot using the Dudek Nucleon Cabrio wing and it is by no means intended to be used as a training manual for this or any other paraglider.
- You may only fly a paraglider when qualified to do so or when undergoing training at an accredited School under instructor's supervision.
- Pilots are personally responsible for their own safety and their paraglider's airworthiness.
- The use of this paraglider is solely at the user's own risk! The manufacturer and distributor do not accept any liability connected with this activity.
- This paraglider on delivery meets all the requirements of the EN 926-1 and 926-2 regulations. Any alterations to the paraglider will render its certification invalid.

Notice

Dudek Paragliders warns that due to the constant process of development the actual paraglider may differ slightly from the one described in the manual.

2. THE WING

Who should fly Nucleon Cabrio?

ou know what active flying is about, you are fond of reflex wing characteristics and you look for a canopy able to carry a trike or another passenger. You want to take-off easily, fly fast, have effective steering and wide speed range on trims at your disposal. Despite your sporty ambitions you prefer to feel safe and comfortable in the air.

Nucleon Cabrio is designed for both trike and tandem flying, albeit with different weight ranges:

- trikes can be flown in entire weight range,
- tandem flying (foot launch) should be done in lower half of the weight range only.

Such limitation is caused by relatively high take-off speed under heavy load, making launch in no wind a hard task. A trike will take-off all right at max load, yet two heavy persons will probably fail. Of course there should be no problem with foot launch when some wind is blowing.

2.1 DESIGN

Nucleon Cabrio is a redesigned, enlarged and adjusted to specific needs version of the regular Nucleon. It has strengthened structure and enhanced rigging. Additional V-shaped mylar reinforcements contribute to exceptional durability and perfect aerofoil reproduction.

Nucleon Cabrio is characterized by its good performance and agility. Take-off is easy, provided that right technique and trimmer settings are used. With proper settings and good engine, pulling A-risers may be not necessary (canopy rises on its own) - a welcomed feature for trike use. In addition, it is possible to clip into A-risers a dedicated launch assist system, shortening risers during trike launch.

A tremendous advantage of the Cabrio is its wide speed range on trims. It is of special importance for tandem and trike pilots, as they have no way to employ standard speed system. In fact, everybody should be delighted with maximum speed, offering joy when overtaking others and broadening your operational envelope.

Incorporation of our own Dudek Reflex Airfoil and corresponding rigging result in comfortable flight even in rough conditions, due to great margin of passive safety.

We are positively sure that the Nucleon Cabrio is the best paraglider available in its class.

The fundamental feature a good PPG and PPGG wing should possess is its great stability and tuck-resistance. When this is achieved, the user does not have to concentrate all the time on steering, thus saving energy for other purposes like navigation, taking pictures or simply enjoying the flight.

Moreover, the faster and safer your paraglider is, the more often you can fly. While the Nucleon Cabrio was designed to retain all the features of a conventional paraglider, application of a reflex aerofoil section added several new qualities.

First of all, using that profile means that the wing stability does not depend exclusively on the pilot's actions anymore. It maintains its own pitch attitude, rising and sinking through thermals while remaining stable above your head, without need for so much pilot input.

Generally speaking the reflex profile is a special kind of aerofoil section. Specific static pressure distribution creates a situation where at low attack angles, only the wing fore part (some 60% of the chord) is producing lift, while the rear 40% of the chord acts as a stabiliser against excessive decrease of the attack angle.

With trimmer system you can considerably raise the rear part of the airfoil, thus effectively reducing projected chord and surface area by some 30%, giving the paraglider a higher wing loading and increasing speed without change in the angle of attack. The centre of pressure also moves forward, adding enhanced pitch stability. Such a shift of loading gives the wing exceptional tuck-resistance and increases projected aspect ratio, resulting in much better performance especially at full speed.

Should you require more lift at lower speeds, the rear section can be pulled down to restore a full airfoil, effective along the whole chord.

Piloting the Nucleon Cabrio actually reminds flying a conventional powered aircraft more than a paraglider.

Below we will try to give you a closer look at some of its remarkable features.

2.2 CONSTRUCTION

The Nucleon Cabrio 3D body was designed in our **CSG** (Canopy Shape Guard) system, comprising many elements resulting in exceptional coherence and stability of the shape.

Below you will find a short description of CSG subsystems.

The Nucleon Cabrio has an elliptical planform with slightly rearward swept tips. Every second cell is divided in two, with ribs additionally supported by

diagonal VSS (V-shaped supports) system. Such arrangement ensures a smooth top surface, exact aerofoil reproduction across the entire wingspan and yet more importantly, minimal number of suspension points.



The lower surface has a RSS (Reinforcing Strap System) applied in the wing's interior. RSS is a ballooning-independent reinforcements system made entirely of paragliding fabric, effectively stiffening and stabilizing the canopy.

Nucleon Cabrio's aerofoil is another product of our Dudek Reflex Airfoil technology. It was calculated with our previous experiences in mind and thoroughly tested with numerical methods. It is a reflex profile, with all its typical features have been described above.



The suspension point areas are additionally reinforced with laminated fabric so that loads are equally distributed on three planes: vertical (through the ribs), diagonal (VSS system) and level (via RSS).

All crossports have been prepared using OCD (Optimised Crossports Design) technology. Carefully designed shapes of the openings and their optimal placement between stress lines guarantee efficient pressure distribution in the canopy and its quick inflation. These openings are scaled together with the ribs, so that their replicability is flawless and they do not disturb the aerofoil in any way.

The Nucleon Cabrio's leading edge is closed to airflow, and its precise shape is supported by reinforcements of laminated fabric.

Cell openings are positioned on the undersurface in the vicinity of leading edge. Their position was chosen very carefully, so that they got maximum ram effect in possibly many flight situations.

In the wingtips there are Auto Cleaning Slots, placed there for easy removal of dirt from inside the wing.

Careful selection of modern fabrics and design solutions brings about great strength and durability of the Nucleon Cabrio. All materials used come from numbered production batches, and each production step can be verified down to identification of specific worker and controller.

Fabric

Each kind fabric has its unique features and characteristics. We composed them so that their interplay creates a perfect blend.

The Nucleon Cabrio's upper surface is made of Porcher Skytex 40 Evolution fabric (formerly named Aquatic), perfectly proven in our earlier wings. Basically it's a nylon material covered with superb E85A impregnate,

introduced into mass production in January 2002 after a series of extensive laboratory and real flying tests. Such covered fabric is not very stiff and - what's most important - has increased tear, stretch and UV resistance. It is not siliconed, so minor repairs can be easily made with self-adhesive strips.

The lower surface is made of Skytex 40 Classic with E38A impregnate. This fabric has a great weight/resistance ratio and is one of the greatest Porcher successes in providing best materials for the paragliding industry.

The ribs must be as rigid and stretch-resistant as possible. We found these qualities in Skytex 40 Hard with E29A impregnate. All reinforcements are made of SR-Scrim.

RIGGING SYSTEM

All of the Nucleon Cabrio suspension lines are sheathed by a coloured polyester layer, covering brownish Technora core. Such composition features high strength and stretch-resistance. The rigging system consists of individual lines looped and stitched at each end.

The upper level lines (gallery) start at the suspension points. Every two lines join one middle layer line. These in turn connect by twos or threes to the main suspension lines, are attached to the risers with triangular quick links (maillons). To prevent their slipping, the lines are kept together with a rubber 'O ring'.

All the maillons are made of corrosion resistant, polished stainless steel, ensuring excellent strength and durability.

Brake lines run from the trailing edge through consecutive cascades to the main steering lines, which are lead through pulleys connected to the rear risers and then fixed to the brake handles.

Steering lines do not carry any load until brakes are applied.

Some of the steering lines are additionally led through rings sewn into the trailing edge. Because of this feature the trailing edge is shortened on application of the brake, so that steering becomes lighter and more effective.

All the lines are distinguished with colours depending on their strength and diameter as follows:

diameter: 2.3 mm; strength: 420 daN; colour: celadon (willow green),

diameter: 1.8 mm; strength: 280 daN; colour: red and orange (the latter for pulling big ears),

diameter: 1.5 mm; strength: 190 daN; colour: violet,

diameter: 1.3 mm; strength: 140 daN; colour: green,

diameter: 1.2 mm; strength: 90 daN; colour: blue,

(colours are subject to slight changes).

THE RISERS

For the Nucleon Cabrio we have chosen four-way risers equipped with:

- an **ELR** (Easy Launch Riser) system. This is an specially marked A rises (yellow ribbon)
- manual speed-system affecting A, B and C risers when engaged, equipped with a handle and trimmer buckle to lock it in desired position;
- trimmers of red band with visible scale, designed for quick and easy replacement in case of deterioration;
- two levels of the pulleys, to be used depending on the hangpoint
- **TST** - Tip Steering Toggle system allowing for aggressive turns at full speed, without distorting the aerofoil and its reflexivity. Dedicated TST handles are provided.
- **TEA** - Torque Effect Adjuster, neutralising the engine torque which tends to turn the paraglider opposite to propeller's rotation. TEA can be adjusted to match you specific combination of paramotor/propeller.



For quick and easy recognition in emergency, some of the risers are distinguished with coloured band as follows:

A - yellow (used for launching)

A' - black neoprene (used for big ears)

B - red (used for B-stall)

D - grey (needed to keep the glider down in strong winds or interrupting the launch).

Main A row suspension lines connect to an A riser (yellow) and A' (blue).

B and stabiliser lines go to B riser (red), C lines go to C riser (black neoprene), and D lines to D riser (grey), which through pulleys keep the steering lines too. Brake handles are attached to the steering lines at optimal places, guaranteeing safe and effective operation. On the main brake lines there are two points marked, higher and lower, to be used depending on the harness hangpoint. On adjusting the steering lines see chapter 3.1.

Our newest neoprene brake handle used in Nucleon Cabrio besides its robust yet light design features EK (Easy Keeper) system - look page 10.

3. FLIGHT OPERATION

3.1 STEERING LINES AND LAUNCH ASSIST ADJUSTMENT

A brand-new Nucleon Cabrio has its steering lines positioned for powered flight in low hangpoint configuration.

Risers of the Nucleon Cabrio are shorter than in most paragliders, so the differences in hangpoints present somewhat smaller problem. Still, there are two sets of pulleys prepared, higher and lower (see risers scheme on page 37). There are spots marked on the main steering lines for fixing the brake handles call for high hangpoints, as they are the most commonly used.

When flying with lower hangpoints if necessary, the brake lines are to be run through the higher pulleys only. The brake handles position should be adjusted according to personal preferences.

General rule is simple - higher hangpoints require longer brake lines, lowerhangpoints require shorter lines.

Before you take your Nucleon Cabrio in the air, we strongly advise to try out everything first. Hang up the entire PPG unit with ropes (in case of a trike it is enough to clip the risers in), sit in and have someone pull up the risers. You must make sure that in flight you will always be able to reach the brake handles, even if the airflow blows them away.

While being suspended in this way, you have a perfect opportunity to adjust the launch assist system too (if present). It should engage the A risers, shortening them when the canopy remains behind the pilot. During inflation its effect should gradually diminish and finally disappear completely as the canopy arrives overhead. If you think the paraglider is rising up too rapidly, lines or straps of assist system should be lengthened.

An additional way to check the whole configuration out is to visit take-off site in steady winds. Inflate the canopy and take it up over your head. When it stabilises, check that the brakes are loose and are not pulling the trailing edge. There should be a spare inch or so before they activate.

Remember that it is always safer to set the margin of play too big than too small. And, most important, the setting must always be symmetrical.

3.2 FREE FLIGHT (no power unit)

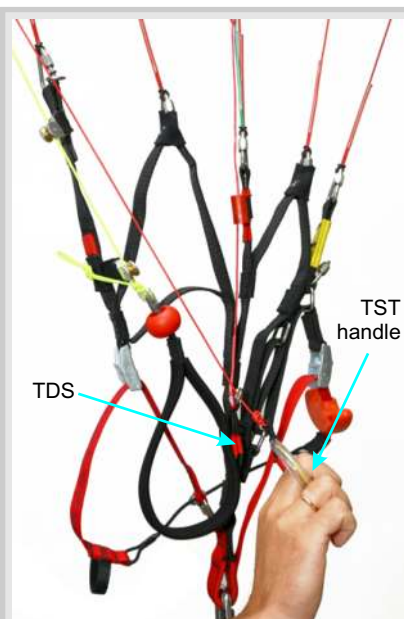
Although the Nucleon Cabrio according to its design book is a fast PPG wing, it behaves surprisingly well as a classic tandem paraglider too and can be used as such without any changes.

The essential difference between Nucleon Cabrio and classic paragliders means that due to its increased tuck-resistance (both during start and flight) and greater speed range it can be safely flown in strong conditions.

Easy Keeper (EK)



Easy Keeper is the name of our proprietary system to hold the brake handles at the risers. The strong neodymium magnets keep them firmly in place, while both attaching and releasing goes smoothly and easily. With Easy keeper you can easily secure the brakes in flight, thus minimizing danger of their contact with the propeller.



TST

In order to facilitate steering the wing while at maximum speed configuration (opened trimmers and full speed-bar) we've invented our own system of controlling the stabilizers.

Prior to grabbing the miniature TST-handles (Tip Steering Toggles) pilot places the main steering handles in special Toggle Docking Stations. In this way you can comfortably steer the wing via

TST handles, not worrying about the brakes getting tangled.

Launch assist system



Additionally mounted straps shorten A risers during inflation (left photo). When the canopy is ready at 12 hrs position, A risers go back to their original length (assist system ceases to work - right photo)

Generally (and paradoxically from traditional point of view) the faster you fly, the safer is your flight.,

Most of tandem and practically all trike launches are executed as alpine (forward) launches due to considerable inertia of pilot/passenger combination. Reverse launches are being done only when it is really impossible to take off the straight way. A reverse launch with a trike is hardly possible at all anyway.

3.2.1 TAKE-OFF

In case of forward launch we recommend that after laying out the wing all lines be taut, without unnecessary play. The paraglider is pulled up with A risers only. The optimal trim setting is "0", that is fully closed. Applying steady pressure on the A risers (or engaging launch assist system) move forward. The wing practically does not overshoot, so the front collapses that otherwise happen quite often at launch, occur rarely with the Nucleon Cabrio. Instead it kind of waits for you to catch up with it.

In case of reverse launch we recommend the trims to be set depending on wind speed (the stronger the wind, the more open position). Due to lack of overshooting tendency take-off is easy, pilot has only to brake slightly before turning.

CAUTION

During take-off it is important to keep the risers under pressure until almost airborne. Reflex profile used has an inherent tendency to increase the angle of attack. In effect, the paraglider can lag behind the pilot when not pulled up appropriately.

3.2.2 FLIGHT

The enlarged speed range of Nucleon Cabrio may demand some attention. However, once you have mastered these additional aspects, flying will become pure pleasure. Good handling will let you make the best use of thermals, and increased speed on glides means that your presence in sinking air will be shorter.

To avoid stalls when braking with slow trims setting (low on scale), their movement is restricted by the tape sewing. (Note: it is possible to push the sewn tape through the buckle with both hands to replace it, but normal operation range is restricted by said place).

When the trims are fully opened (high on scale) the wing becomes faster and stiffer, increasing its stability even more. The brake forces increase too, as well as the distance to the stall point. The radius and bank angle in turns grow proportionately to the growing brake forces. If the trims are set fast (or fully opened) and the wing is not flown near the ground, a switch to TST steering is advised. TST system can be used at all trimmer settings.

3.2.3 LANDING

With closed trimmers Nucleon Cabrio lands like any other paraglider. The brake forces, initially low, are growing proportionally, giving ample warning before stalling. Still you should be careful when flying at low speeds until fully familiar with brake operation.

Landing with trims set fast (above "0" position) may require proportionately more space, as the paraglider has a lot of kinetic energy and careless application of brakes may even cause the wing to climb.

Most pilots get to know the wing relatively fast and quickly gain enough trust to fly it in stronger conditions than they did ever before. Still, you should always be careful when flying low.

Remember that Nucleon Cabrio flies faster than classic paragliders and sometimes it can be of importance (e.g. when landing on a slope).

After landing in strong wind the paraglider can be safely put down with a strong pull on the rear D risers.

3.2.4 WINCHING

Nucleon Cabrio is not designed for winching. As mentioned before, reflex profile used in the wing has an inherent tendency to increase the angle of attack. While in normal flight such a disposition makes it safer, during winch start it can be dangerous. Nevertheless, a lot of successful winches on Nucleon Cabrio have been made.

Experience shows that it should only be done with trims set a couple of centimeters above "0" point.

To sum it up: winching can be done, but proper attention must be paid.

3.3 POWERED FLIGHT

CAUTION: Before each start it is necessary to have a thorough check of the wing, harness and power unit (trike).

In powered flight most of the wing characteristics remain as described above (chapter 3.2). Still there is additional information needed - concerning power output, proper matching of the wing/engine/propeller etc.

Dudek Paragliders cannot take responsibility for all possible combinations, but if you contact us in doubt, we are always ready to help.

First flights

In order to get familiar with your wing we recommend flying with trimmers set slow, because in this configuration Nucleon Cabrio behaves as a classic paraglider. Flying like that try pulling the brakes some until you feel resistance, usually it will be at about 1/4 of the range.

Once you feel competent with your wing, you can start experimenting with faster trim settings and speed system. Learn to use all the additional speed and safety of the Nucleon Cabrio .

3.3.1 TAKE OFF

Classic foot launch

Even when it seems that there is no wind at all, it is rarely so. Therefore always be careful in determining the conditions, as in PPG flying it is most important that the launch and initial climb are performed with a head wind (danger of losing your airspeed while crossing the wind gradient is greatly reduced). Special attention must be paid to trees, power lines and other obstacles, including the possibility of emerging rotors.

Wing preparation

Lay out the paraglider downwind of the power unit, with all suspension lines taut and pointing toward center of the power unit. The risers are to be laid on the ground. Set the trimmers at "0" (see fig. 2). In strong conditions faster settings can be advised. Make sure that you warm up the engine while standing windward of the wing. Stop the engine before clipping in the risers.

Now have a quick check whether:

- the helmet is on and locked
- the risers are clipped in the carabiners
- the trimmers are set,
- nothing will get in propeller's way
- steering lines and handles are free and not twisted
- engine is delivering full power
- airspace is clear for take off

When you are sure everything is OK, you can clip in the wing and execute launch as described in paragraph 3.2.1.a.

From now on you should steer the paraglider facing forward only, without looking back over your shoulder (when the wing is low behind you, turning back can cause some lines to get in the propeller). Possible tripping and falling is dangerous (and costly due to probable propeller loss!) so this should be avoided at any price, even that of some damaged lines!

During launch, when you feel that the strain on both risers is equal, open up full power and lean back to counter the engine thrust, so that it can push you rather forward than towards the ground. The best option is not to use the brakes at all and let the paraglider rise as it was laid out. If it starts to swerve from its course, just pull the opposite riser and run under the centre of the wing while preserving starting direction. If the wind suddenly weakens, give a stronger pull on the risers.

If the paraglider drops to one side or back too far to be lifted again, kill the engine, abort launch and check the conditions once again.

As the wing rises, the forces grow lighter and it should stabilise above your head without overshooting. This is the best moment to check if it is inflated well and the lines are not tangled, but do it without stopping nor turning. If you feel the forces on the risers decrease, run faster and let go of the risers. See whether there is any opposition on the brakes and, if necessary, use them to correct direction or to increase lift at take-off.

REMEMBER:

- If the cage of your power unit is not stiff enough, the risers strained during launch can deform it to the extent of colliding with the propeller. Before giving it full power, check that the cage is free of any lines.
- Any brake operation (or steering inputs in general) should be smooth and gentle.
- Do not try to take off until you have your wing overhead. Hitting power before that can cause dangerous oscillations.
- Do not sit in the harness until you are sure you are flying!
- The faster the trim setting, the more brake input is required for lift off
- The lower the hangpoints of your power unit, the easier is the launch.

Forward launch with trike

Basic difference of the trike launch is that you are using your power unit to get the wing overhead, and instead of pushing the A risers usually a launch assist system is used.

After all preparations and checks, with the risers properly clipped in you can start the engine. If a launch assist system is used, there is just a steering handle in one hand, with the other hand grabbing the other brake handle and throttle. Depending on power output of your motor initially open the throttle only enough to fill up the canopy and get it above the propeller downwash.

When the trailing edge gets some three meters above ground and both risers are equally loaded, open the throttle fully. Preferably you should not be using the brakes during launch at all and let the canopy rise as it was laid out. If you see it getting off course, give a delicate counter brake and steer

your trike under canopy root (center), while maintaining general take-off direction steady as possible. If the wing drops too far to the side or behind you to get it up again, switch off the engine, abort launch and re-evaluate conditions.

As the canopy rises, its resistance grows lighter and it should stabilise above your head without overshooting. Too hasty corrections of launch direction can result in sidewise oscillations – still, if they are not too deep, you can keep full power in order to get off the ground as soon as possible.

After lift-off canopy will stabilize itself overhead and throttle can be eased off a bit to get desired climb speed.

Reverse launch in strong wind

Reverse launch can be executed only as a foot launch or with ultralight single-seated trike. You can do it holding both A risers and one brake in one hand, with throttle and the second brake in the other hand. With a decent wind it is by far the best way. In weaker wind it is better to choose a forward launch, as running backwards with an engine on your back is not an easy thing to do. It is reasonable not to pull the wing up until you are really determined to launch, especially when it is clipped in.

Lay down the rolled paraglider with the trailing edge facing the wind. Unfold the wing enough to find the risers and check that no lines are looped over the leading edge. Stretch the risers against the wind, separating the left and right one.

We suggest that you lay the risers in the same way as you will be turning during a reverse launch, and place one riser over the other, with the rear risers upmost. It should be done this way because once you clip in, the cage of your power unit will make turning on your own impossible.

Now run the pre-launch checklist.

After warming up the engine put the power unit on, turn to face the wing, go to the risers and clip them in the appropriate carabiners. Pulling on the front and rear risers open the cells. It is a good idea to pull up the wing briefly in order to check that the lines are not tangled. Holding the risers, brakes and throttle as described above, pull the front risers and raise the paraglider over your head. On most occasions you will

not have to brake it, especially if the trimmers are set for fast flight. Perhaps it does not agree with your experience, but this is the way the reflex profile works. When the trimmers are opened (set above “0”), the reflex profile stabilises the wing and does not allow it to surge forward. It can even stay back a little - in such case pull the brakes a little and the glider will come forward.

Once you have it overhead, turn around, open the throttle and take off. As with the classic launch, in this case too you have to find such combination of trimmers, brakes and throttle settings that will give you the best speed and rate of climb.

CAUTION: You are launching with your hands crossed. You have to really master this technique before trying it with a running engine on your back.

Climbing

Once you took off safely, continue heading against the wind, using brakes to correct rate of climb. Do not try to climb too steeply - attempts to increase climb rate by pulling the brakes will have an adverse effect - due to the additional drag actual rate of climb will worsen, and with the throttle fully open even a stall can happen.

In powered flight the Nucleon Cabrio behaves more like an aeroplane than a paraglider, and it is good idea to think about it in this way. If there are no obstacles present, it is by far safer (and more impressive for the spectators) to fly level for a while after take-off and gain some speed before converting it to height with a brief pull on the brakes.

Another reason not to try climbing too steeply is the risk connected with engine failure at low altitude. Although the Nucleon Cabrio in a steep climb does not stay back so much as conventional paragliders do, low speed can easily lead to a stall. Besides, you should always be able to land safely in case of engine malfunction, so it's better not to take unnecessary chances and fly with a safe margin of speed.

Depending on the power unit geometry, it is possible that after take-off you will notice a propeller torque (turning moment). It will try to turn you around, so be prepared for counter-steering with a brake or harness cross-bracing. If it happens during steep climb on slow trim and full power, beware of the stall possibility.

Due to typical PPG and PPGG feature - considerable vertical distance between thrust axis and wing chord - the range of safe power operation is closely related to your skills and equipment.

Power-unit induced oscillations

Certain configurations of engine weight, output, propeller diameter and height & width of hang points can cause serious oscillations, during which the pilot is lifted to one side by the torque effect, swings down due to his weight, then is lifted again and so on.

To avoid this you can:

- change the throttle setting and/or
- slightly pull (not causing a turn!) and hold one brake to counteract the torque if there is one present and/or
- shift yourself to the other side of the harness and/or
- change the trimmer setting.

Such oscillations usually occur at full power - the greater the engine output and propeller diameter, the bigger the swings. In addition there are often too late or wrong pilot reactions, increasing the trouble instead of solving it. In any case the safest way to deal with this question is to reduce throttle and release the brakes.

Especially less-experienced pilots tend to overreact. It is called a pilot-induced oscillation, and proven solution in this case is to leave brakes alone.

3.3.2 LEVEL FLIGHT

Once you have gained safe height after take-off and wish to go for a route, you can turn onto the right direction, fully open the trimmers and let off the brakes. If the conditions are turbulent it can look foolhardy, but this is the essential feature of the reflex profile - the faster you fly, the safer your Nucleon Cabrio is.

That's why you really can confidently release the brakes and enjoy your flight.

CAUTION: Some pilots with previous free-flying experience may have a well-grounded habit of keeping the brakes slightly applied at all times. Such a technique, while quite reasonable on a free-flying wings as it allows for quick pilot reactions and decreases sink, is not advisable on reflex-profile wings. When you pull the brakes, the Nucleon Cabrio airfoil actually loses its self-stabilizing features.

If you happen to have a variometer or altimeter aboard – watch it. In level flight it is very easy to start climbing unintentionally. The instruments will help you optimise speed and fuel economy. Of course the economy of each flight will depend on current configuration of your gear, but thanks to its ability to fly safely without constant steering the Nucleon Cabrio will let you adjust everything to the best effect.

Good knowledge of weather conditions (e.g. wind at different altitudes) and intelligent use of thermals, convergence and other kinds of lift will help you greatly reduce fuel consumption and increase flight range.

Of course the engine is always there to help you find the right spot. Once there, do not hesitate to lead the Nucleon Cabrio into thermalling, in order to

gain altitude and save fuel. Possible shortening of the trimmers will make the climb ratio even better.

Trimmers and manual speed-system operation

The reflex wing section enables the Nucleon Cabrio pilot to use a wide range of trimmers and speed-system action. You are free to experiment with all possible settings, as long as you are on safe altitude.

Fully opened trimmers increase the speed and stability of the wing, and with it also its ability to cope with turbulences and overall penetration. As forces on the brakes grow at high speeds, steering with TST system becomes increasingly effective. Turns executed in this way are slightly wider, but needed steering force will be smaller and airspeed will not decrease.

With slow trimmer settings there is an improvement in sink rate and steering forces diminish, so exploring the thermals becomes possible.

Additional, manually operated speed-system is there to increase the airspeed even more when necessary. Before usage you have to set the trimmers fully open. Then you can symmetrically pull down both speed-system handles. Later on it can be released by unlocking the buckles and pushing them upwards. In some cases using the speed system can be impossible, e.g. when significant take-off weight requires great force to activate it.

Study drawings showing trimmer operation as well as their influence on the canopy shape.

Independent of the current wing configuration and speed, turns can be much tightened and more effective with differential brake operation. Slight use of the outer brake (with considerable amount of the inner one) will diminish the loss of lift during turn. Turns can be much improved by additional use of throttle as well. Once with growing experience you will master these techniques, you will be able to execute fully coordinated and effective turns, that will bring to mind the aeroplane handling.

REMEMBER:

- Trimmer setting is another part of the pre-start check list!
- If it will be asymmetric, the wing will be turning all the time. And if you will inadvertently set them off, the reflex profile of the Nucleon Cabrio will keep the wing level, so after opening the throttle you'll start to descend with increased speed instead of climbing.

3.3.3 LANDING

In paramotor flying there are two kinds of landing: with and without power.

Power off landing

At an altitude of 50 metres switch the engine off and start gliding down as on a conventional paraglider. It reduces the chances of damaging the propeller on landing, but on the other hand there is only one attempt possible - so it has to be done right!

With or without power Nucleon Cabrio better copes with turbulence on open trimmer. So, if the conditions are rough, it is better to make an approach with greater speed, plan a lot of space (as for a hanglider) and wear that speed off before touching down. Nucleon Cabrio preserves the energy well, so there is a long float necessary to exchange the abundant speed for lift.

If the landing field is not big enough and you have to land on the spot, we advise you to close the trimmers. It will increase lift coefficient of the wing, simultaneously decreasing its sink rate and speed.

Such an action is especially important when flying with high surface loading.

Landing with power on

Make a flat approach with the engine idling, then level out and lose the speed before final flare. Immediately after touchdown switch off the engine.

The main advantage of this procedure is of course the possibility of a repeated approach in case of misjudgement. Still, if you forget to switch off the ignition before the wing falls down, there is a considerable risk of damaging propeller, catching lines in it or even suffering injuries connected with tripping over on your running engine.

REMEMBER:

- Whenever possible, get to know the landing field before taking off.
- Check the wind direction before planning the approach.
- Landing with power off requires much less space.
- In case of any doubt, practice the landing until you feel totally safe.

3.3.4 GOLDEN RULES!

- Never place the power unit downwind of the paraglider.
- Check, double check and then check once again if there is no fuel leakage.

- ◉ Do you have enough fuel for the flight? It is always better to have too much than too little!
- ◉ Check if there is nothing loose in the harness, that could possibly contact the propeller in flight
- ◉ Whenever you encounter a problem, fix it at once however small it is!
- ◉ Always put on and lock the helmet before getting in the harness
- ◉ Before each launch run a full pre-flight inspection
- ◉ After landing, control the wing facing the direction of flight, as on turning you always risk getting lines in the propeller. Turn only if there is danger of falling on your back
- ◉ Do not ask for trouble - do not fly over water, between trees or power lines and other places where engine failure will leave you helpless
- ◉ Beware of turbulence caused by other gliders or even yourself, especially when flying low
- ◉ It is not reasonable to let go of the brakes below 100 meters, because a possible power unit malfunction may require immediate attention
- ◉ In general never trust your engine, as it can stop at any moment.
- ◉ Always fly as if that's exactly what it's going to do
- ◉ Unless it is not absolutely necessary (e.g. collision avoidance), do not try tight turns against the torque direction. Especially when climbing you can easily enter a stall and consequent negative spin
- ◉ Do not fly at low altitude with a tail wind, as it pretty much narrows your options!
- ◉ Do not wait for the problem to grow - any change of engine sound or a vibration can indicate some trouble, or even serious trouble. You'll never know until you land and check it out
- ◉ Be certain of your navigation
- ◉ Remember that not everyone is fond of your engine noise.
- ◉ Do not scare the animals.

3.4 QUICK HEIGHT LOSS

3.4.1 BIG EARS

In order to get the big ears you have to pull down the outer lines of the A' risers (usually distinguished with blue colour) by about 50 cm.

While inducing big ears you should never never let the brakes out of your hands.

After tucking the tips in, Nucleon Cabrio will continue to fly straight with increased sink rate (up to 5 m/s). You can steer the wing pretty efficiently with weight-shifting.

After releasing the lines, the paraglider will usually open up on its own or you can assist it with a long stroke of the brakes.

For the sake of safety (the possibility of a parachutal stall) it is reasonable to engage speed system after pulling big ears in order to lessen the angle of attack of the wing centre. Executing big ears with open trimmers is very difficult due to the reflex profile stabilisation.

CAUTION! See the PARACHUTAL STALL chapter.

Never try to pull big ears during powered climb, as the increased drag can lead to increase of the angle of attack and a parachutal stall.

Besides, pulling the ears while climbing is pointless anyway.

3.4.2 SPIRAL DIVE

A spiral is characterised by reaching the highest sink rates possible. Significant G-forces, however, make it difficult to sustain a spiral dive for long, as it can place high loads on both pilot and glider. Never do this manoeuvre in turbulence or at too high bank angles. Control the dive and do not exceed 16 m/s sink. If the dive is not stopping after releasing the brake, assist the glider with the outer one.

NEVER DO BIG EARS IN A SPIRAL!

In this manoeuvre smaller number of lines is carrying an excessive load multiplied by the centrifugal force, what can lead to damage of the lines or even the paraglider itself (load of a single line can be much higher than passed in certification trials (i.e. 8 G).

3.4.3 B-STAL

o enter a B-stall, simultaneously pull down both B-risers (red tape) by 10 – 15 cm. The wing will collapse across the entire span along its B-row, the airflow over top surface will break and canopy surface will be decreased.

Forward movement will be almost completely stopped.

Further pulling B-risers is not advised, as it increases wing instability. If the canopy forms a horseshoe with both wingtips in front of the pilot, gently apply both brakes to recover.

To exit a B-stall, the risers should be released in a smooth and decisive manner.

On quick and symmetrical releasing B-lines the airflow will reinstate and the wing will surge forward, returning to normal flight. In contrast to classic paragliders, in case of Nucleon Cabrio there is no need to

counter this surge with brakes - yet another feature of the reflex profile!

CAUTION: see Parachutal Stall.

All rapid descent techniques should be practised in smooth air and only with sufficient height! Due to Synthesis Cabrio size and significant take-off weight many of the manoeuvres described above will be practically impossible.

BY FAR THE BEST TECHNIQUE IS SAFE AND CORRECT FLYING, SO THAT YOU WILL NEVER NEED TO DESCEND RAPIDLY!

3.5 ACRO FLYING

Nucleon Cabrio was not designed to do any aerobatics.

3.5.1 WING OVER

You make a wingover by performing a series of consecutive, alternating turns with growing bank angle. Too much banking connected with some flaws in co-ordination and execution can evoke pretty dynamic collapse.

CAUTION: Steep turn with bank angle over 60 degrees is a prohibited aerobatic manoeuvre!

3.6 EXTREME FLYING MANOEUVRES

CAUTION: EXTREME FLYING MANOEUVRES SHOULD ONLY BE CARRIED OUT DURING SAFETY TRAINING COURSE (INSTABILITY TRAINING) UNDER PROPER GUIDANCE!

WHILE PROVOKING OR EXITING REAL SITUATIONS THERE IS A DANGER THAT YOUR ACTIONS WILL PROVE TOO QUICK OR TOO STRONG, SO YOU SHOULD ALWAYS EMPLOY GOOD JUDGMENT, STAY CALM AND TAKE MEASURED ACTIONS.

Since all actions required to exit or prevent dangerous situations on Nucleon Cabrio are typical and pilots flying this wing should already have proper experience, we are going to describe only the characteristic features of Nucleon Cabrio.

Description of standard methods dealing with extreme situations can be found in textbooks.

3.6.1 ASYMMETRICAL COLLAPSE

Even when the trimmers are fully opened or the speed system is engaged, collapses practically do not occur and can be induced only by a very strong turbulence.

Still, if it happens, a little counter-steering is enough to keep the Nucleon Cabrio on course. In normal conditions with collapses up to 50% of the wingspan, your paraglider will reinflate instantly and spontaneously.

3.6.2 FRONTAL COLLAPSE

Even when the trimmers are fully opened or the speed system is engaged, collapses practically do not occur and can be induced only by a very strong turbulence.

Still, if it happens, a little counter-steering is enough to keep the Nucleon Cabrio on course. In normal conditions with collapses up to 50% of the wingspan, your paraglider will reinflate instantly and spontaneously.

3.6.3 PARACHUTAL STALL

Under normal conditions does not occur.

If you want to prevent it happen at all, simply stick to a couple of rules:

- after B-stall, release the risers quickly and evenly. Don't be afraid - Nucleon Cabrio does not jump forward excessively;
- before big ears execution, ease off the trimmers a bit. This will increase both the sink rate and safety margin, as big ears constitutes an aerodynamic brake with significant loss of speed.

Nevertheless, if a parachutal stall happens simply open the trims and/or push the A risers forward.

3.6.4 LINE OVER and CRAVATTE

Nucleon Cabrio is a modern wing which, in order to decrease drag, has fewer suspension lines and greater distance between them. Therefore it's always possible that after a tuck stabiliser may tangle in the lines. Usually a couple of pulls with a brake settles the matter. If it's not enough, try to untangle it with big ears or a stronger pull on the risers.

In case of any doubts you should always consider throwing a rescue chute. It is there as a normal equipment part, not just an ornament ;)

3.6.5 STEERING IN EXTREME SITUATIONS

In case of any malfunction that renders normal steering impossible, you can safely steer and land Nucleon Cabrio using the D-risers (grey marking) or stabilo lines. Directional steering can be executed by TST handles too.

4. PARAGLIDER CARE

Looking after your paraglider will prolong the life of your Nucleon Cabrio

STORAGE

Store the paraglider in a dry place, away from chemicals and UV exposure.

Never pack or store the glider when wet, as it significantly shortens life of the fabric.

Remember that the wing becomes damp even while lying on green grass in full sunlight, as the grass transpires.

A good precaution to avoid dampness and/or UV when you have to wait in a start queue is to use quick-pack after rigging up.

Always dry the glider thoroughly before packing or storage.

While drying, never expose your paraglider to direct sunlight.

To avoid excessive paraglider fabric wear, do not pack it too tightly.

Please note that with frequent exercises on a field or a small hill your paraglider will deteriorate faster due to its repeated rising, falling and being dragged around.

CLEANING

Clean the paraglider with water and a soft sponge. Do not use any chemicals or alcohol, as these can permanently damage the fabric.

REPAIRS

Repairs should only be carried out by the manufacturer, authorised distributor or authorised workshop. It is acceptable to fix minor cloth damage with the self-adhesive patches included in the package.

DETERIORATION: A FEW TIPS!

Generally speaking, your paraglider is made of nylon - a fabric which, like any other synthetic material, deteriorates through excessive exposure to UV rays that come with the sunlight.

Hence it is recommended to reduce UV exposure to a minimum by keeping the paraglider packed away when not in use. Even when packed in a bag, it should not remain in the sun for long.

Nucleon Cabrio' suspension lines consist of Technora inner core and polyester sheath. Submitting them to excessive loads in flight should be avoided, as it can cause irreversible damage. Frequent bending is not desirable too.

Keep the paraglider clean, since getting dust in the lines and fabric will reduce their durability.

Be careful to keep snow, sand or stones from entering the cell openings: their weight can slow or even stall the glider, and sharp edges can damage the cloth.

Prevent lines from catching anything, as they can overstretch or tear. Do not step on the lines.

Uncontrolled strong wind takeoffs or landings can result in the leading edge of the canopy hitting the ground hard, which may seriously damage the ribs, sewing and surface material.

Knots can chafe suspension and/or brake lines.

Check line lengths after tree or water landings, as they can stretch or shrink. A line plan is included in this manual or may be obtained from the dealer when needed.

After landing in water you should check the wing fabric as well, since the wave forces can cause the fabric to distort in some areas. When taking the wing out of the water, always do it by trailing edge, so that water can flow out freely. After a sea landing, rinse the paraglider with fresh water. Since salt crystals can weaken the suspension lines even after rinsing in fresh water, you should replace the lines with new ones immediately after contact with salt water.

Every second year Nucleon Cabrio should undergo technical inspection by the manufacturer or authorised distributor.

5. TECHNICAL DATA

Nucleon Cabrio	42
Certificate	-
Number of cells	62
Surface (flat) [m ²]	42,00
Surface (projected) [m ²]	35,77
Span (flat) [m]	15,06
Span (projected) [m]	12,07
Aspect ratio (flat)	5,40
Aspect ratio (projected)	4,07
Sink rate [m/s]	min = 1,8; trym = 2,0; max = 3,0
Speed [km/h]	min = 35; trym = 45; max = 62
Max. cord [cm]	332,00
Min. cord [cm]	66,40
Lines length incl. risers [cm]	964,00
Total lines length [m]	609,67
Weight range [kg]	170-310
Weight [kg]	11,0
Lines	Technora: 1,2 & 1,3 & 1,5 & 1,8 & 2,3
Fabric	SkyTex Evolution 40 g/m ²
	SkyTex Clasic 40 g/m ²
	SkyTex Hard 40 g/m ²
	SR Scrim, SR Laminate 180 g/m ²
Risers	PASAMON - Bydgoszcz, Polska

6. WARRANTY AND AEROCASCO

Purchase of a new paraglider is a serious expense for any pilot. That is why we cover our paragliders with extensive warranties and additionally offer an AeroCasco insurance against damage and repair costs.

WARRANTY

Dudek Paragliders guarantees free of charge repairs caused by the material or production faults along following scheme:



For the free-flying paragliders warranty covers **36 months** (3 years) or 300 flight hours (depending on what comes first). If the paraglider is used for powered flights, every hour spent in the air should be counted as two (does not apply to dedicated PPG canopies).



For the PPG paragliders warranty covers **24 months** (2 years)/200 flight hours (depending on what comes first).



For the mountaineering (MPG) and speedflying wings as well as school and profit users warranty covers **18 months** (1.5 year)/150 flight hours (depending on what comes first).

WARRANTY DOES NOT COVER:

- canopy colour fading
- damage caused by chemicals or salt water
- damage caused by incorrect use
- damage caused by emergency situations
- damage resulting from accidents (airborne or not)

WARRANTY IS ONLY VALID IF:

- flight hours are correctly registered in the logbook of the owner (and possible earlier owners), distinctly marking PPG flights,
- the paraglider is handled in accordance with the operating manual,
- the purchaser has not carried out any repair by him/herself (excl. minor repairs with self-adhesive patches),
- carried out any modifications,
- the paraglider can be unmistakably identified
- the paraglider was being inspected according to prescribed timetable.

If you have bought your paraglider second-hand, ask its previous owner of the paraglider for a logbooks copy (total of flying hours since the date of first purchase).

AEROCASCO



Normal warranty does not cover repairs of damages caused by the user or a third party. As costs of such repairs can be considerable, Dudek Paragliders offer an AeroCasco insurance. It covers a one-off repair of any mechanical damage, no matter how big and whoever inflicted them. The only expenses the purchaser has to pay are shipping costs and so-called share-of-cost amount.

AeroCasco can be purchased only for a brand new paraglider (at the paraglider purchase). Its cost is 50 euro.

NOTE: AeroCasco is not available for all paragliders (check this before purchase). It can be obtained for privately used wings only.

AeroCasco applies only to damages that took place during take-off, flight or landing. Obviously, all faults in the material and manufacturing flaws are covered by normal warranty.

When handing the paraglider for the repair you have to present a card confirming its AeroCasco status. After the repair you will have to cover only the share-of-cost value of 50 euro.

AeroCasco is valid for one repair only. There is a possibility to extend AeroCasco for one more year. To do this you have to send your paraglider for inspection not later than a year after the date of purchase. Extension fee is 75 euro (incl. inspection).

Remember to attach the AeroCasco confirmation on expedition.

AeroCasco does not apply to any of the following: theft, colour fading, damage caused by incorrect storage or transport, damage caused by chemicals, salt water and force majeure.

7. WHAT HAVE YOU BOUGHT

The Dudek paraglider that you bought should have the following items:

- paraglider itself (canopy, lines and risers)
- transport bag (with compression strap)
- MotoBag - specialised double function backpack
- windsock
- pocket with paper work and repair wallet including:
 - piece of self-adhesive fabric (10 cm x 37.5 cm) for small repairs. Note that even small tears located in the vicinity of stitches have to be repaired by an authorised service.
 - looped and stitched suspension line longer than the longest line used in the paraglider that is to be used as a temporary replacement. Do not cut it if you have to replace a shorter line, just tie it at the length needed.
 - paraglider passport with entered date of purchase and valid technical inspection (please check the serial number with the sticker on the wing tip).
 - User Manual you are reading.
- Small gifts.

MotoBag



MotoBag is a dedicated solid backpack for PPG wings, made of proven Cordura fabric. Simultaneously it doubles as a quickpack if necessary.

Beside comfortable shoulder straps to hold it traditionally on your back it has side handles too, so that you can carry it like a suitcase when needed.

After turning it inside out it becomes a quickpack that will shelter your unfolded wing when you are in a hurry.

SUMMARY

If you respect the rules of safe flying and proper glider care, you will enjoy many years of pleasant airtime on Synthesis Cabrio. Still, you must be aware of possible dangers and face them wisely. You must accept the fact that all air sports are potentially dangerous and your actual safety depends solely on you.

We insist that you fly safely, and this concerns both the weather choice and safety margin during all manoeuvres.

FLYING THE PARAGLIDER IS ALWAYS YOUR OWN RESPONSIBILITY.

SEE YOU IN THE AIR!

8. RIGGING TABLES

Lengths are measured with a specialised, computer-operated device. All lines are stretched with a 5 kg load before cutting. Thanks to the abovementioned device and proper procedures, final tolerance of line lengths does not exceed 0.15%.

xP - main suspension line of x row,

xD - secondary line of x row,

xT - third level of x row (near the canopy),

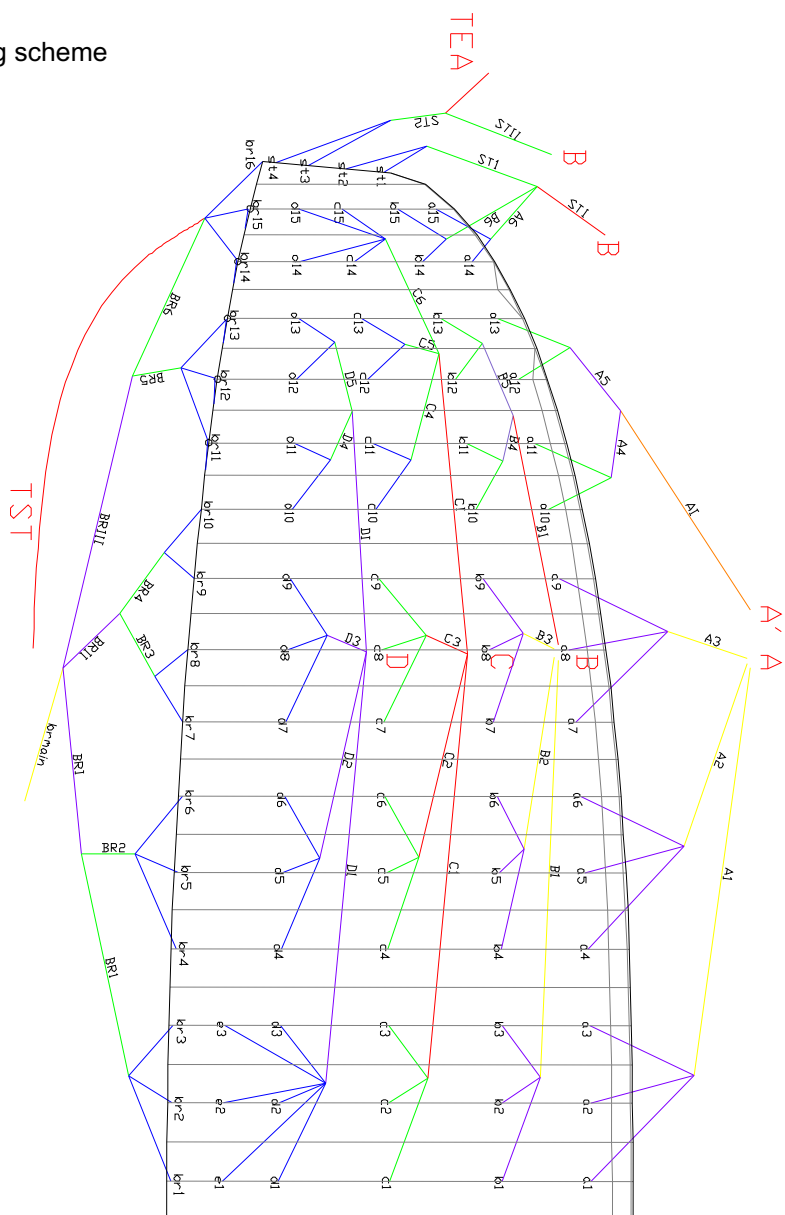
FC - fourth level of steering lines (near the canopy).

CAUTION!!! Distances given below are to be understood as distances between connection points. When cutting a line for repair, 20 cm extra must be added, as at each end a 10 cm stitch is required to fix the loop. The only exception is the main steering line (brmain), which is looped only at the upper end, while there is 30 cm left on the lower end for fastening brake handle (this means in total you have to cut 40 cm longer line than in the table).

Length of the steering line is given assuming lower hang points (shorter brakes).

In case of high hang points the line is about 15 cm longer (the brake handle is to be attached lower).

Rigging scheme



Nucleon Cabrio – 42

Line lengths given in [mm]:

	a	b	c	d	e	br
1	2715	2705	2730	2630	2780	1925
2	2660	2645	2670	2570	2720	1670
3	2685	2670	2695	2600	2745	1550
4	2640	2625	2655	2485		1615
5	2600	2585	2610	2435		1490
6	2630	2615	2645	2470		1520
7	2600	2565	2605	2360		1035
8	2545	2515	2560	2300		860
9	2545	2515	2555	2295		970
10	920	895	900	925		925
11	800	780	750	785		1365
12	865	830	830	835		1135
13	810	780	720	770		1010
14	775	710	885	995		970
15	640	605	805	910		885
16						955

	A	B	C	D	E	BR
1	6330	6280	6320	6585		2185
2	6360	6315	6350	6680		1990
3	6375	6355	6375	6775		1090
4	1755	1695	2420	1730		860
5	1580	1545	2195	1555		990
6	1690	1730	1935			865

	A	B	C	D	E	BR
I	6220	6245	5615	6345		3270
II						4475
III						3685

	st1	740 ST1	1565	brmain	3200
st2	800 ST2		7365		
st3	635 STI		5925		
st4	665 STII		245		

Total line lengths:

	a	b	c	d	e	br
1	9065	9005	9075	9245	9385	10570
2	9005	8945	9020	9185	9325	10315
3	9030	8970	9045	9215	9350	10195
4	9020	8960	9035	9195		10065
5	8975	8915	8990	9145		9940
6	9010	8950	9025	9180		9970
7	8995	8935	9010	9165		9785
8	8940	8890	8960	9105		9610
9	8945	8890	8960	9095		9490
10	8905	8850	8950	9010		9445
11	8785	8730	8800	8865		9415
12	8675	8630	8650	8745		9170
13	8620	8585	8540	8680		9035
14	8400	8375	8445	8555		8860
15	8270	8275	8370	8475		8755
16	8245	8305	8255	8285		8685

Technora 7343-090-005:



Technora 7343-140-006:



Technora 7343-190-024:



Technora 7343-280-011:



Technora 7343-280-018:



Technora 7343-420-041:



9. RISERS: DESIGN AND ACCESSORIES

Figure 1 Hangpoint setting: A - high, B - low

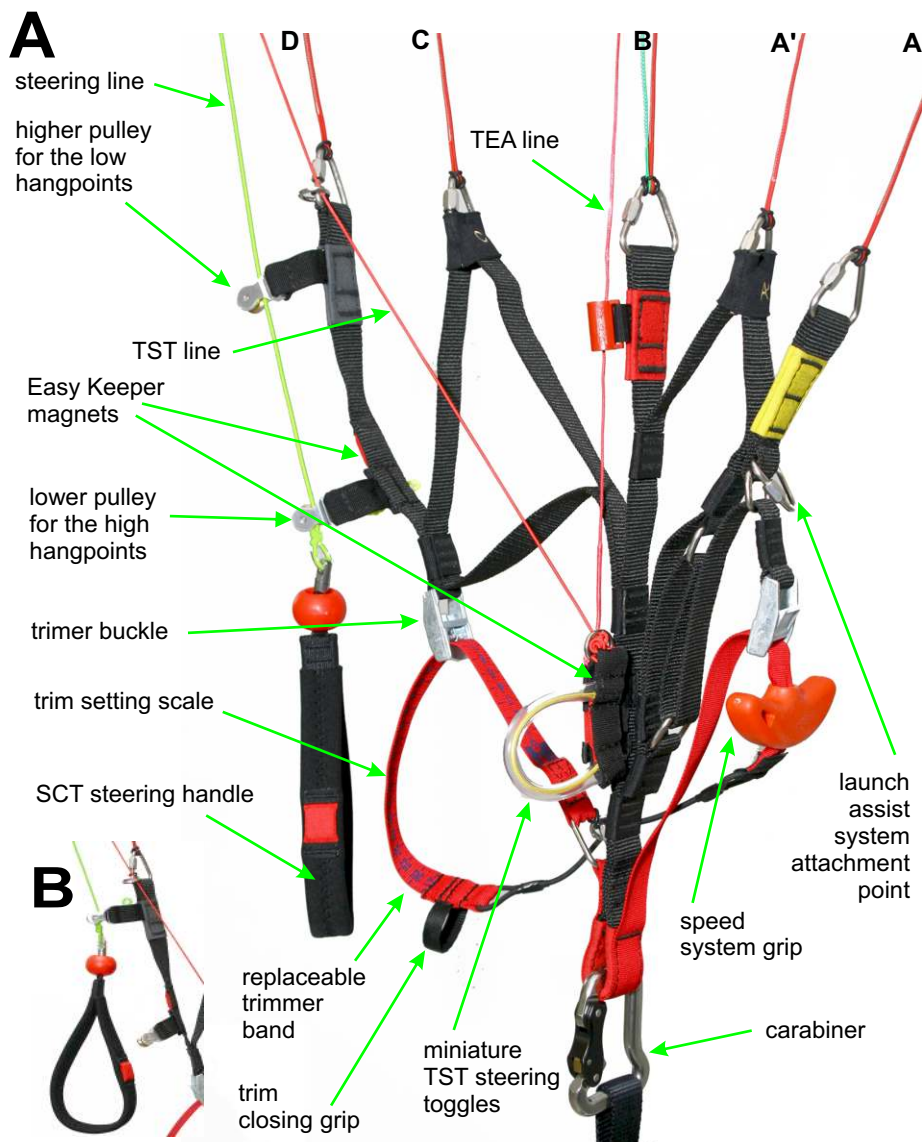


Figure 2 Trimmers influence on the wing section

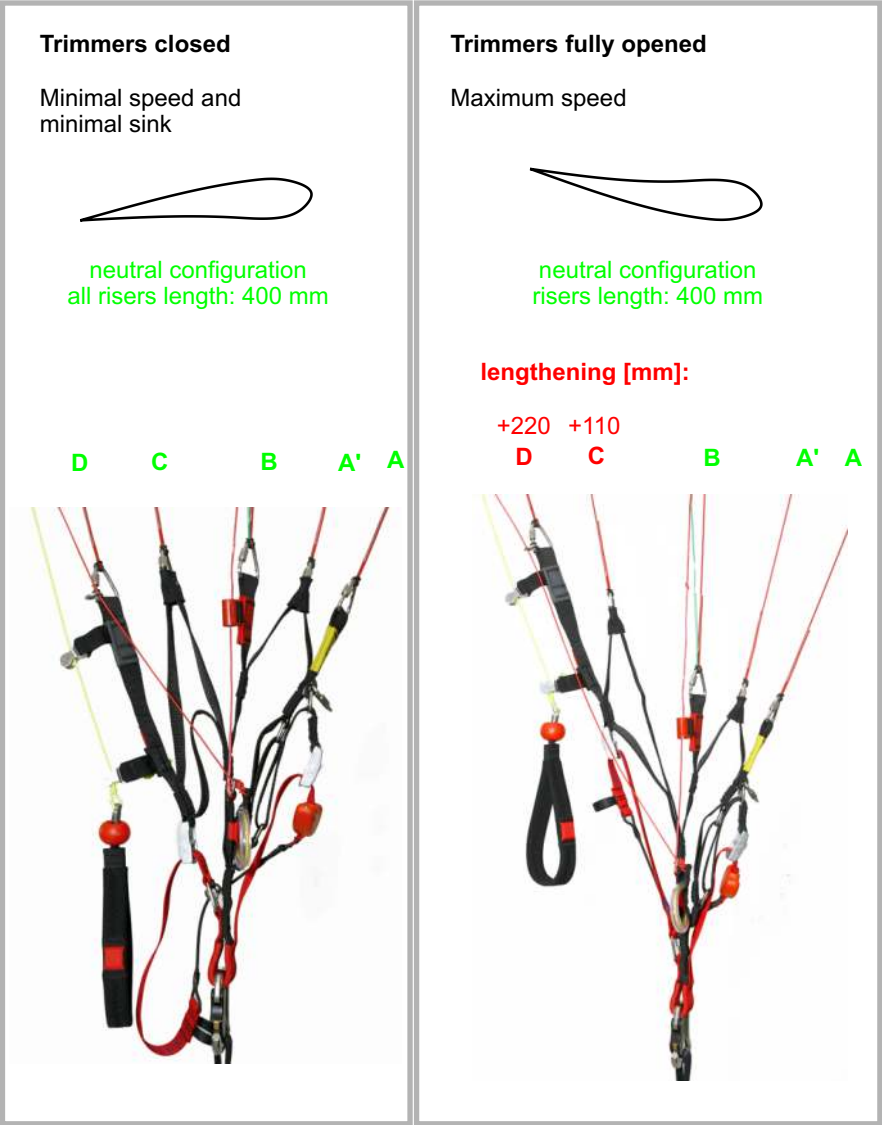


Figure 3 Trimmer and speed-system settings influence on the wing section

Activating of the manual speed-system



Full acceleration with opened trimmers:
maximum speed and sink



neutral B risers length: 400 mm

lengthening [mm]:

+220 +110

D

C

shortening [mm]:

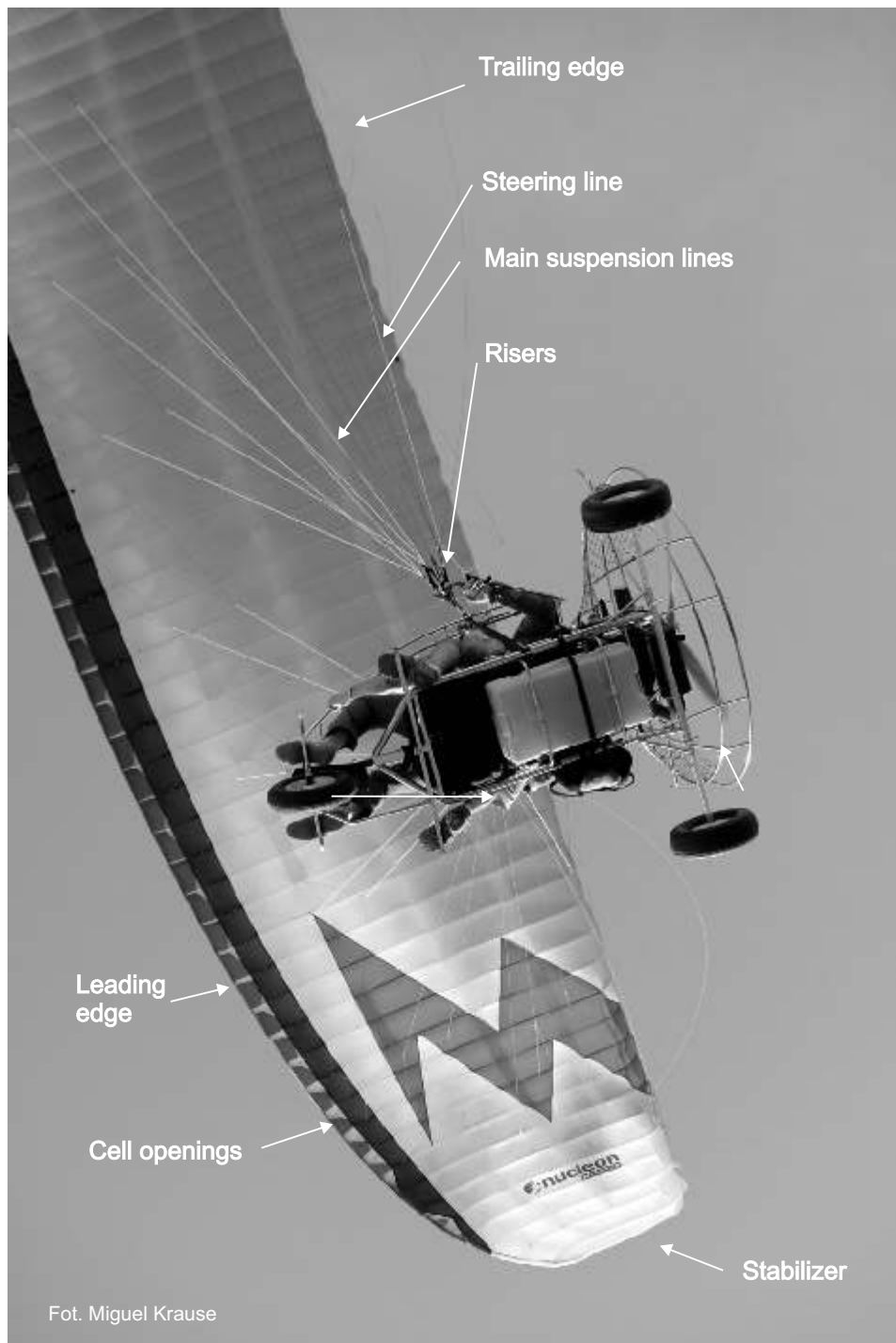
-25 -50

B

A'

A





Fot. Miguel Krause

Paragliders for inspections and repairs are to be delivered to our production plant:

Dudek Paragliders
ul. Leśna 5
89-200 Kowalewo k/Szubina
POLAND



Dudek Paragliders
ul. Centralna 2U
86-031 Osielsko, Poland
tel. +48 52 324 17 42
export@dudek.eu

www.dudek.eu

made in europe